Laser diode controller in rewritable optical recording devices

The invention relates to an optical recording device for recording on rewritable media with which two different states depending on the information content are generated on the medium.

For writing optical media, for example, laser diodes are used to heat up the medium spot by spot. When a material layer of the optical medium is heated beyond its melting point, the material of this layer may be melted spot by spot. Without further supply of energy the information carrier material cools down fast and changes from the molten state to an amorphous state. With dosed energy supply, which keeps the information carrier material below the melting temperature for a certain period of time, but above the crystallization temperature inherent in this material, the information carrier material changes to a crystalline state. Since the reflection properties of the information carrier layer in the crystalline and in the amorphous state are widely different, the stored data may again be read by evaluation of the amount of reflected light.

Since during the writing operation the phase condition of the information carrier layer is determined by the energy applied to a certain area within a certain period of time, the control of the power produced by a laser diode as such is not sufficient, because soiling such as, for example, finger prints and dust particles on the surface of the optical storage medium, absorbs the energy applied to the material. If the energy applied by the laser diode is too small as a result of the soiling, the information carrier layer at this spot may go over to an amorphous state instead of a crystalline state, which is contrary to the projected effect. If the energy for the compensation for such soiling is selected to be higher, the energy applied at spots without soiling may become so high that the information carrier material changes over to a crystalline state undesirably. This would lead to the fact that the written information does not correspond to the information one would have liked to write.

For controlling the writing operation the written state is read preferably during the writing operation, to recognize disturbances of the writing operation and to compensate for them.

An optical recording device in which the amount of light used for the writing is controlled by changes in the reflected light is known, for example, from JP 5-292672. The

reflected light is buffered by means of the sample-and-hold circuit and compared to a reference value. The difference between measured value and reference value is used for controlling the amount of light radiated by the laser diode used for the writing.

It is an object of the invention to provide the control of the output power of the laser diode used for writing, so that it is also suitable for rewritable media.

This object is achieved in that during the writing of the states the reflection is measured of only one of the states and the measured value is used for controlling the power of the laser diode even when the other state is written.

Preferably, when a highly reflecting (= crystalline) state is written, the reflected amount of light is measured by means of a signal peak detector and compared to a reference value. In case of deviations, for example, as a result of soiling of the surface of the storage medium, the power of the laser diode is readjusted accordingly. The readjustment factor determined in this manner is also retained for writing a low-reflection (= amorphous) state. The invention here assumes that the soilings affecting the writing operation cover a large surface. An individual readjustment for writing during a low-reflecting state is not necessary as a result. A channel coding ensures that each state repeats itself only a limited number of times anyhow. In this manner it is ensured that the highly reflecting states are not too far apart and the distances between highly reflecting states to be written are generally smaller than the extent of the soilings.

Preferably, the reflection is measured at the spots where a piece already in the highly reflecting state is overwritten with a highly reflecting state.

The invention will now be further described and explained on the basis of examples of embodiment shown in the sole Figure.

The example of embodiment shows an optical recording device comprising a control circuit 1 according to the invention for controlling the writing operation of a laser diode 2 on an optical medium 3. The optical medium 3, for example, a CD-RW, is driven by a motor 4 shown diagrammatically. In a control circuit 5 is determined the respective laser power of the laser diode 2 necessary for achieving a certain write strategy and is predefined as a target value Px of the control circuit 1. By means of a photodiode (not shown) the storage medium is read out at the same position where it is written. The reading signal is applied to a peak value detector 6 and generates a reading signal M. This reading signal is compared to a reference signal Mref and the difference signal is applied to an input of a multiplying stage 11 via a control network 13. The time-dependent control behavior of the control circuit 1 is determined by the control network 13.

Another input of the multiplying stage 11 is supplied with the nominal power Px. The output of the multiplying stage 11 is applied to a first input of a summing circuit 12. To set the point of operation of the laser diode, the other input of the summing stage 12 is supplied with an offset voltage. When the amount of reflected light changes, the gain factor of the control circuit is adjusted accordingly so as to provide as constant a power as possible on the storage medium 3 when one or the other state is written.